

WHAT IS CLAIMED IS:

1. Apparatus for sensing one or more physical parameters at a remote location, comprising:

5 a tubing containing a communication cable and a sensor in communication therewith, the sensor being located within the tubing proximate the remote location;

a sealing device configured to seal a section of the tubing containing the sensor from fluid flow within the tubing, the sealing device configured to be actuated between a sealing state and a non-sealing state;

10 a communication device in fluid communication with the remote location and the section of tubing containing the sensor; and

a control line in communication with the sealing device and configured to actuate the sealing device between the sealing state and the non-sealing state.

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2. Apparatus for sensing one or more physical parameters at a remote location, comprising:

a first tubing containing a communication cable and a sensor in communication therewith, the sensor being located within the tubing proximate the remote location;

20 a second tubing having a first end in fluid communication with the first tubing proximate the sensor, and a second end; and

a fluid barrier reservoir containing a barrier fluid, the fluid barrier having a first opening in fluid communication with the second end of the second tubing, and a second opening in fluid communication with the remote location.

3. The apparatus of claim 2 further comprising a first flow control element disposed within the second tubing between the first tubing and the fluid barrier reservoir, the first flow control element configured to be actuated between a first state
5 allowing fluid flow in the second tubing in any direction, and a second state restricting fluid flow in the second tubing from the barrier fluid reservoir to the first tubing.
4. The apparatus of claim 3 further comprising a second flow control element disposed within the first tubing, the second flow control element configured to be
10 actuated between a first state allowing fluid flow in the first tubing in any direction, and a second state restricting fluid flow from the first tubing.
5. The apparatus of claim 2 further comprising a gel plug disposed within the second tubing between the first tubing and the barrier fluid reservoir, the gel plug comprising a volume containing a gel selected to chemically isolate the barrier
15 fluid from fluids within the first tubing.
6. The apparatus of claim 5 further comprising a third tubing having a first end in fluid communication with the barrier fluid reservoir, and a second end in fluid communication with the remote location, and further comprising a fluid actuated control valve disposed within the third tubing, the fluid actuated control valve
20 being responsive to open when fluid is pumped through the first, second and third tubings.
7. The apparatus of claim 2 further comprising a fluid motive apparatus for passing fluid into the first and second tubings, and a fluid volume measuring device configured to measure the volume of fluid passed into the first and second tubings
25 by the fluid motive apparatus.

8. Apparatus for sensing one or more physical parameters at remote locations, comprising:

a first tubing containing a communication cable and a plurality of sensors sensor in communication therewith, each said sensor being located within the tubing proximate a respective remote location; and

a plurality of fluid barrier sensing sections, each said fluid barrier sensing section comprising:

a second tubing having a first end in fluid communication with the first tubing proximate one of the sensors, and a second end; and

a fluid barrier reservoir containing a barrier fluid, the fluid barrier having a first opening in fluid communication with the second end of the associated second tubing, and a second opening in fluid communication with the associated remote location.

9. A fluid barrier for isolating a sensor contained within a tubing from an environment at a location proximate the sensor, comprising:

a fluid conduit having a first end in fluid communication with the tubing proximate the sensor, and a second end; and

a first fluid barrier reservoir having a first opening in fluid communication with the remote location, and a second opening in fluid communication with second end of the fluid conduit, the first opening being distal from the second opening, the first fluid barrier reservoir containing a first fluid having a first specific gravity.

10. The fluid barrier of claim 9 further comprising a second fluid barrier reservoir disposed within the fluid conduit between the first fluid barrier reservoir and the

tubing, the second fluid reservoir having first and second openings for connecting to the fluid conduit, the first opening being distal from the second opening, the second fluid barrier reservoir containing a second fluid having a second specific gravity different than the first specific gravity.

- 5 11. The fluid barrier of claim 10 wherein the second fluid barrier reservoir is located elevationally higher than the first fluid barrier reservoir, and further wherein the first specific gravity is greater than the second specific gravity.

- 10 12. The fluid barrier of claim 11 further comprising a fluid actuated control valve disposed within the fluid conduit between the second fluid barrier reservoir and the tubing, the fluid actuated control valve being responsive to open when fluid is pumped through the fluid conduit towards the second and first fluid barrier reservoirs.

- 15 13. The fluid barrier of claim 10 wherein the first and second fluids are essentially immiscible with one another, and further wherein the first fluid is selected to be essentially chemically inert with an environment at the remote location.

14. Method for chemically isolating a sensor from a location at which a parameter is to be measured by the sensor, the location being in a fluid environment, comprising:

- 20 emplacing within a tube a sensor in signal communication with a communication cable, the sensor being located within a section of the tube proximate the location at which the parameter is to be measured;

 isolating from fluid flow within the tube the section of the tube containing the sensor; and

exposing the isolated section of the tube containing the sensor to the fluid environment at the location.

- 5 15. The method of claim 14 further comprising emplacing within a tube plurality of sensors in signal communication with the communication cable, the sensors being located within selected sections of the tube proximate associated selected locations at which the parameter is to be measured, selectively isolating from fluid flow within the tube selected sections of the tube containing the associated sensors, and exposing the isolated selected sections of the tube containing the associated sensors to the fluid environment at the associated locations.

- 10 16. Method for chemically isolating a sensor from a location at which a parameter is to be measured by the sensor, the location being in a fluid environment, comprising:

15 emplacing within a tube a sensor in signal communication with a communication cable, the sensor being located within a section of the tube proximate the location at which the parameter is to be measured;

placing in fluid communication with the section of the tube containing the sensor a fluid reservoir, the fluid reservoir further being placed in fluid communication with the fluid environment;

isolating the tube to prevent passage of fluid out of the tube; and

- 20 passing a first fluid into the tube to cause the fluid to flow into the fluid reservoir.

17. The method of claim 16 further comprising measuring the volume of the first fluid passed down the tube and into the fluid reservoir, and ceasing flowing the first fluid into the tube when a sufficient volume of the first fluid has been passed down the tube to fill at least a portion of the fluid reservoir.

18. The method of claim 17 further comprising placing in flow-through fluid communication with the section of the tube containing the sensor and the fluid reservoir a second fluid reservoir, and passing a second into the tube to cause the second fluid to flow into the second fluid reservoir.
- 5 19. Apparatus for protecting sensors and fiber optic cables surrounded by fluids which are inert with respect to the sensors and optical cables located in a sensor highway which includes a fluid reservoir containing one or more barrier fluids which reservoir is connected on one side of the fluids to the sensor highway and on the other side of the fluids is connected to hydrocarbon reservoir fluids and
10 where the fluids in the fluid reservoir form a barrier against the ingress of molecules from the hydrocarbon reservoir fluid to the sensor highway side of the fluid reservoir where the sensors and optical cable are located.
20. A pressure sensor which includes one or more liquids forming a barrier against ingress of foreign molecules from the fluid whose pressure is to be measured.
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